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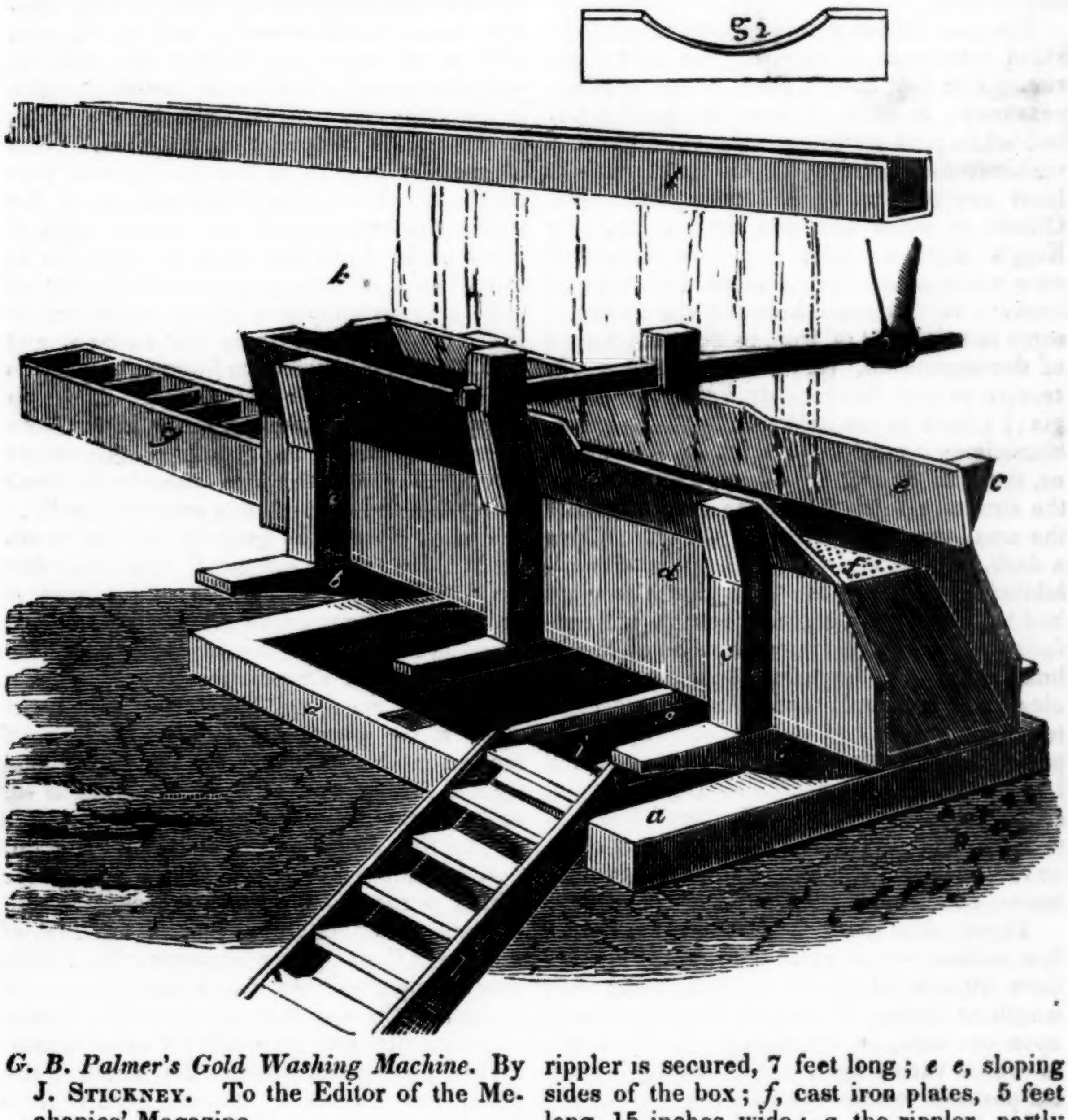
"Knowledge is power."



G. B. Palmer's Gold Washing Machine. By J. STICKNEY. To the Editor of the Mechanics' Magazine.

DEAR SIR,—Accompanying this rude sketch of a Gold-Washing Machine I also send you a few remarks, which, from various circumstances, will of necessity be still more crude and hasty.

REFERENCES.—*a a*, parts of a horizontal frame, 5 feet long, 3 wide; *b b*, rockers supporting the trunk of the machine; *c c c*, posts inclosing the trunk; *d*, trunk in which the rippler is secured, 7 feet long; *e e*, sloping sides of the box; *f*, cast iron plates, 5 feet long, 15 inches wide; *g*, the rippler, partly drawn out; *h*, outside rippler, stationary; *i*, a box, conveying the water to the outside rippler; *k*, the head, or feeding place; *l*, water conductor. The rockers are shod, and stand on plates of iron; a bolt fixed in the sill passes into a hole in the centre of each, to keep them from slipping. The sill of the centre frame, (to which is fastened the handle,) continues beyond the post, and, when

the machine is in operation, beats upon two irons on the lower frame. to give motion to its contents. When washing, the rippler is locked up in the body of the trunk, and not seen ; the true form of its partitions is seen at *g* 2d. The machine is "fed" at *k*, and the stones, &c. discharged at the sloping end; the gold and sand having passed through the plate, *f*, into the rippler which contains mercury, if any gold escapes the first ripple it is supposed to be caught in the one outside.

The gold mines of this country may be divided into those of *vein*, *surface*, and *deposite*. The first have a great diversity of appearance ; in some of them the gold is imbedded in pure white quartz rock, and often visible to the naked eye. Of this kind is at least one vein at Carroll county, Georgia. Others in white and red sand stone, (the King's Mountain mine possesses masses of pure white stone, which is so friable as to crumble to fine sand between the fingers ;) some in sulphuret of iron, in different stages of decomposition, (of this kind is an extensive vein at Narcoochly Valley, in Georgia ;) others in the oxides of iron, or ochres. Sometimes it appears in dark spongy masses, the gold tipping the edges, and points of the structure in such manner as to resemble the small flowers of lichens. In some mines a dark, porous, and vitrious substance is exhibited, impressing the idea that the mass had been suddenly cooled when in extreme fusion. In one specimen from South Carolina the gold is disseminated in small particles through a rock, resembling fine variegated marble ; as it does not contain lime, I presume it a species of slate. Another, which I obtained at the celebrated Duncan vein, (No. 1052 of the Georgia Lottery,) has particles of rich gold embedded in strata of slate, or rather of slaty structure, unctuous, of pearly lustre, and somewhat resembling stratite.

These veins are of various widths, from a few inches to that of several feet, but I believe little is known as yet respecting their length or depth. They are usually inclined upon one side, or are said to dip, the angle of which varies from that of nearly a vertical position, to more than 45°.

In places where the soil has been washed from the sides of hills, these veins of quartz, of various sizes, are seen traversing the micaceous slate, or gneis, and, as it may be presumed that some of these small as well as large ones contain gold, it may not be unreasonable to account for the *surface* and *deposite* mines, by supposing it to be disintegrated from its natural bed by the effects of frosts, atmosphere, water, &c. Veins thus broken down, and the gold disengaged, will constitute what is called *a surface mine ;* one of this kind before the door of a neighboring dwelling is now being operated upon, worth from two to three dollars per hand, per day, which has been trodden under foot for thirty years. From these *surface mines* the gold (being assisted by every shower that forms a rill) finds its way to the beds of the streams, and is deposited as soon as the gravity of each particle overcomes the force by which it is impelled forward ; being heavier than other substances, and by the constant changing of the beds of the streams, and other causes, it finds the lowest situation in the deposite, that is, next to the slate, which arrests its downward progress. Next in specific gravity is the quartz and iron rocks, which are also found resting on the slate, and are covered by various strata of other soils, from the depth of from one to thirty feet ; and as the constant deposition of gold may be supposed to be going on by fresh accumulations from the surface, and particles disengaged from fragments of rocks by attrition, in their way downward, and as the progress of these *particles* is in some degree impeded by the firmness of this quartz strata, we are enabled to account for their being diffused through this mass generally.

I should not thus gravely attempt to account for "*gold in deposite*," was it not that we have philosophers who assert that it *grows*—that new creations of the precious metal are afforded "day by day ;" and others, that those streams *were its natal beds*, and it has remained here since the creation ; while others say that an eruption of the mountains at some distant period had ejected forth a golden shower, of which we are now reaping the harvest.

The first object of the operator on a deposite mine is to ascertain its value, for which purpose he usually proceeds in the following manner: He finds the depth of the "grit," or quartz deposite, by forcing down a slender iron rod. If not too deep, he excavates the soil in pits or ditches. When reaching the grit he washes a small quantity, and proceeding through that strata to the slate, tries it again by washing, and if from these results in several places he forms a favorable opinion, he sets about preparing the mine by cutting ditches for the streams, and others for draining the mine, which sometimes are necessary to be twelve or fourteen feet deep, and of great length. His supply of water for washing must be brought in in small canals six or eight feet above the surface of the mine, and often times the fountain must be sought a mile or two from the

place of operation. The next thing is to place his machine, or rockers, where they will be most convenient for the plan of his future operations; he then clears a pit ten feet wide, and from ten to one hundred and fifty yards in length. As soon, however, as a portion of the grit is laid bare, a number of the hands are employed in raising, and others in wheeling it in barrows to the machine, where one is employed to fill it, one to move it, one to cast away the cocks when washed, and perhaps another to keep the outside rippler clear from sand. The grit being placed in the machine, (which in some respects resembles a family cradle,) and agitated from side to side under the streams of falling water, washes the gold and sand through the cast iron plates into the inside rippler containing mercury, where, by the strong affinity or attraction which exists between the mercury and the gold, the latter is secured, while the sand is washed away. When the day's work is finished the rippler is drawn out, the gold in amalgam washed and secured, and the mercury expelled by heat. It is then sent to the refiners, where all foreign substances (silver excepted) are destroyed by the different agents employed in this fluxes, and (if correctly refined) valued accordingly, the quantity of silver in different mines is supposed to vary from two to forty per cent.

Machines of various constructions have been used in collecting the gold, but the one here represented has mostly taken the place of all others among regular miners. It was invented and patented about three years since by Mr. G. B. Palmer, of Spartanburgh, South Carolina, whose experience in mining enabled him to embrace in this simple form every requisite principle for effectually collecting the fine as well as coarse particles of gold. His price for rights amounts to a mere compensation for his expense and labor in perfecting his improvement.

We fear that the richest mines in this vicinity are mostly wrought out, and that we shall soon begin to feel the effects of the "*removal of the deposites.*"

Most respectfully, yours, &c.

J. Stickney.

History of Chemistry. [Continued from page 155.]

Of Copper.—Copper is one of those metals which were known in the most early ages of the world, and has at all times been one of the most easy to extract and manufacture. The Egyptians employed it for a variety of uses, and made of it cast figures, remarkable for their elegant form, in the remotest times of their history. The Greeks manufactured it, melted it, cast it, and employed it in various arts. With them it made the base of the celebrated compounds called Corinthian Brass. The Romans likewise manufactured it in great quantities; and it has ever been imagined that the greater number of their utensils were always made with this metal, and very rarely with iron. This circumstance has been urged as a valid proof that they knew little of iron, and were unskilful in manufacturing it.

The alchemists employed themselves much about copper. They called it *Venus*, on account of the great facility it possesses of combining with many substances, particularly with other metals, and because of the sort of adulteration it makes in these compounds.

By representing it by the emblem appropriated to gold, terminated at bottom by the sign of a cross, they considered it as formed chiefly of gold, but disguised and altered by something acrid and corrosive, which rendered it crude. Though, in the different periods of the great revolution, which has changed the face of chemistry, we cannot find any researches concerning copper that are immediately connected with the annals of this revolution, or have served to lay the foundation of it, yet this metal holds a rank among those substances, of which the properties are better known, and the modifications have been more accurately determined, since the establishment of the pneumatic doctrine. In this class of properties, accurately explained by the modern theory, we ought particularly to place its different degrees of oxidation, its solutions in acids and in ammonia, its precipitates from the metallic state to its highest degree of oxidation, and its reduction by various processes. The labors of Berthollet, Guyton, and Proust, have particularly contributed to the accurate knowledge of these last mentioned facts. Our knowledge of this metal has also become much more complete, and the facts concerning it by far more simple, since the discoveries which have been lately made in experimental chemistry. It holds almost the third rank among metals in this respect. With regard to its elasticity, it holds nearly the same rank. Its ductility has led Guyton to place it in the sixth rank of metals, between tin and lead. It may be reduced into laminæ, or leaves extremely thin, which the wind will blow away. Its tenacity likewise is pretty considerable: a copper wire, one-tenth of an inch in diameter, supports a weight of 299¼ pounds, without breaking. Its strength or resistance to being broken is estimated by Wallerius as nearly equal to that of iron. Its sonorous

quality is superior to that of iron, as may be proved by wires of the two metals of equal length and thickness.

This metal is of a fine red color, and has a great deal of brilliancy. Its taste is styptic and nauseous; and the hands, when rubbed for some time on it, acquire a peculiar and disagreeable odor.

The density of copper is such, that its specific gravity is to that of water as 7·788 to 1·000. This gravity, however, varies according to the state of the metal: when it has only been melted and cast, it is less than when it has been hammered and forged; but after having passed through the mill, and been drawn into wire, it has the specific gravity of 8.878, which is an increase of about one-seventh.

Its power of conducting caloric has not been accurately ascertained, though it is known to be very great. It does not melt till it is very red. Its fusibility has been estimated by Mortimer at 1450 degrees of Fahrenheit's thermomether, and by Guyton at 27 degrees of the pyrometer of Wedgewood. When it is melted and cast into ingot moulds, that it may cool quickly, it assumes a granulous and porous texture, which shows like a kind of *crumb* in its fracture, and is liable to exhibit many cavities and flaws in its interior parts. If it be cooled slowly, it yields crystals in quadrangular pyramids, or in octahedrons, which arise from the cube, its primitive form. At a temperature above what is required for its fusion, it rises in vapor, and in a visible smoke, as is observed in places where this metal is cast in the large way, and in the chimneys over the furnaces.

Copper is a very good conductor of electricity and galvanism; but its order and power in this respect, compared with that of other metallic substances, has not yet been determined with precision. The acrid and somewhat fetid smell which pretty sensibly characterizes and distinguishes copper, is well known to every one. Rubbing the hand a little time on it is sufficient to impart this coppery odor, to which some other phenomena of the organ of smell have even been compared, particularly that of a *cold in the head.*

Copper is pretty abundantly diffused throughout nature. Germany, Sweden, and Siberia, however, are the three countries where it has hitherto been found in the largest quantity, and which furnish the most to commerce and the arts. The states of this metal in the earth are so various in their appearance, and in their physical properties, that mineralogists have singularly multiplied the species of it: some have admitted fifteen or twenty, though it is difficult to reckon nine or ten really different from each other in their nature. What they have taken for species are only varieties.

Native copper is met with pretty frequently in the interior parts of the earth, where it is even found very pure. It is known by its brilliancy, its red color, its ductility, and its specific gravity. Most commonly its surface is of an obscure dull and brown red, on account of the slight oxidation it has experienced. Sometimes it is found shining, and as if it had been burnished or polished; but this is much more rare than the preceding. Its form is frequently crystalline and regular; that of Siberia distinctly exhibits the cubic figure.

The places where native copper is most frequently observed are Siberia, Norberg, in Sweden, Newsol, in Hungary, and Saint-Bel, near Lyons.

Copper exposed to cold air, and particularly to damp air, soon loses its lustre; it tarnishes, becomes of a dull brown, grows gradually darker, acquires what is called the color of antique bronze, and at last becomes covered with a sort of green tint, tolerably bright, known to every one by the name of *verdigris*, or *verdet gris*, as the modern French chemists will have it.

The atmospheric oxygen begins by converting the surface of the metal into brown oxide; this oxidation is favored and accelerated by water. The carbonic acid soon unites itself with the copper thus oxidized; so that the kind of varnish of antique medals, statues, and utensils of various kinds, which antiquaries prize in them, and which they call *patine*, is nothing but a true super-oxygenated carbonate of copper, very analogous to malachite or mountain green.

This alteration of copper is much more powerful and rapid, if the temperature of the metal be increased. Every one may have observed how quickly the copper tunnels, used for carrying off the smoke of stoves, change their color from the moment they are first heated, even slightly, in contact with the air: they speedily assume a blueish, orange, yellowish, or brown tinge, which at length becomes wholly of an uniform deep brown over all the surface. These different and very beautiful hues are obtained even by cautiously exposing on burning coals thin plates or laminæ of copper, as well as that which is in light leaves. By this process, leaves of a sort of *foil* are made of various colors, which are chiefly used, after being cut into small pieces, for covering children's toys, to which they are fastened by a kind of

mordant or cement, previously applied on them. In fabricating these, the succession of blue, yellow, violet, and brown, may be observed; the last color too is that which remains, and is permanent.

When the action of fire on copper is strongly urged; when it is thrown, for instance, in the form of fine filings, into a very strong fire, or when it is heated in a crucible to a white heat after having been melted, it burns much more rapidly than in the former cases; it experiences a real conflagration; it even yields a very brilliant green flame. Accordingly, it is employed in the composition of the colored fires of the smaller kinds of fireworks, particularly those which are called table fire-works. The same effect which is perceptible at the surface of the crucible in which copper, thoroughly fused and very red, if melted and stirred, is produced by sending through this metal, in a small piece, or in wire, or in thin leaves, an electric discharge. It instantly emits a greenish flame, breaks with decrepitation, and is dispersed in smoke or dust in the air. It may be collected on paper, and will be found covered with a reddish brown oxide. It is to this property likewise we are indebted for the green color which we so frequently see in the flame of various combustible substances, but particularly alcohol, when cupreous salts have been dissolved in it. Notwithstanding the activity of this sort of combustion, and its difference from the slow oxidation already described, the oxide resulting from it uniformly contains but twenty-five parts of oxygen to a hundred of the metal, and completely resembles that which is obtained by the former kind of combustion.

We are yet ignorant of the union of copper with the first combustible substances; particularly with azote, hydrogen, and carbon, with which it is even believed to be incapable of combining. All we know is that hydrogen and carbon decompose the oxide of this metal, take from it its oxygen, and reduce it to the metallic state at a red heat.

Copper is capable of combining with most of the metals; and some of its alloys are of very great utility.

The alloy of gold and copper is easily formed by melting the two metals together. This alloy is much used, because copper has the property of increasing the hardness of gold, without injuring its color. Indeed, a little copper heightens the color of gold without diminishing its ductility. This alloy is more fusible than gold, and is therefore used as a solder for that precious metal. Copper increases likewise the hardness of gold. According to Muschenbroek, the hardness of this alloy is a maximum, when it is composed of seven parts of gold and one of copper. Gold alloyed with one-twelfth of pure copper, by Mr. Hatchett, was perfectly ductile, and of a fine yellow color, inclining to red. Its specific gravity was 17·157. This was below the mean. Hence the metals have suffered an expansion. Their bulk before union was 2732, after union 2798. So that $916\frac{2}{3}$ of gold, and $83\frac{1}{3}$ of copper, when united, instead of occupying the space of 1000, as would happen were there no expansion, become 1024.

Gold coin, sterling or standard gold, consists of pure gold alloyed with one-twelfth of some other metal. The metal used is always either copper or silver, or a mixture of both, as is most common in British coin. Now it appears that when gold is made standard by a mixture of equal weights of silver and copper, that the expansion is greater than when the copper alone is used, though the specific gravity of gold alloyed with silver differs but little from the mean. The specific gravity of gold alloyed with one-twenty-fourth of silver and one-twenty-fourth of copper was 17·344. The bulk of the metals before combination was 2700, after it, 2767.* We learn from the experiments of Mr. Hatchett, that our standard gold suffers less from friction than pure gold, or gold made standard by any other metal besides silver and copper; and that the stamp is not so liable to be obliterated as in pure gold. It therefore answers better for coin. A pound of standard gold is coined into $44\frac{1}{2}$ guineas, or $46\,\frac{7}{10}$ sovereigns.

Platinum may be alloyed with copper by fusion, but a strong heat is necessary. The alloy is ductile, hard, takes a fine polish, and is not liable to tarnish. This alloy has been employed with advantage for composing the mirrors of reflecting telescopes. The platinum dilutes the color of the copper very much, and even destroys it unless it be used sparingly. For the experiments made upon it we are indebted to Dr. Lewis. Strauss has lately proposed a method of coating copper vessels with platinum instead of tin; it consists in rubbing an amalgam of platinum over the copper, and then exposing it to the proper heat.

Silver is easily alloyed with copper by fusion. The compound is harder and more sonorous than silver, and retains its white color even when the proportion of copper

* The first guineas coined were made standard by silver; afterwards copper was added to make up for the deficiency of the alloy; and as the proportion of silver and copper varies, the specific gravity of our gold coin is various also.

exceeds one half. The hardness is a maximum when the copper amounts to one-fifth of the silver. The standard or sterling silver of Britain, of which coin is made is a compound of $12\frac{1}{3}$ silver and 1 copper. Its specific gravity after simple fusion, is 10·200. By calculation it should be 11·33. Hence it follows that the alloy expands, as is the case with gold when united to copper. A pound of standard silver is coined into 66 shillings.

Mercury acts but feebly upon copper, and does not dissolve it while cold; but if a small stream of melted copper be cautiously poured into mercury heated nearly to the boiling point, the two metals combine and form a soft white amalgam.

There is no metal more useful than copper, excepting iron, to which it yields the superiority. Every one knows that a great number of instruments and utensils are made of copper for various purposes. Those vessels which are to be placed upon the fire are generally made of it, as it is much less liable to alteration than iron, and at the same time much more easy to be wrought. Its alloys with zinc and tin are employed for a great number of purposes in the arts, and in common life. But unfortunately this medicine acts as a poison upon the animal economy; and it is one of the bodies that most threaten our existence. It is therefore much to be wished that it were proscribed, at least for economical and domestic uses. Cisterns, reservoirs, pipes, and cocks, made of this metal, or its alloys, are no less dangerous than copper pans; and frequently they are even more pernicious, as they are not kept with the same care as the vessels, the whole of which is exposed to view at once, and which are employed several times a day. Too much care, attention and prudence, cannot be employed in the use of all utensils made of copper, as all its oxides are extremely susceptible of dissolving in fat, oils, and most of the unctuous substances that are employed in the preparation of food. Frequent tinning is the most certain defence against this terrible evil.

Besides the varied and multiplied uses of copper in the metallic form, several ores and preparations of this metal are employed in a great number of the arts. The pyrites sulphurets serve for the preparation of the sulphuret of copper, by their spontaneous efflorescence and their lixiviation; it is also prepared by burning a mixture of sulphur and copper. The malachites are cut and polished for trinkets; copper is continually alloyed with zinc and tin for making brass, casting statues, bells, pieces of artillery, &c. Its different salts and oxides enter into the preparation of colors for painting; of the baths; the preparations and mordants for dyeing; of enamels and glazings for pottery and porcelain; and of colored glasses.

Of Iron.—Iron is the most important and most useful of all metallic substances. Without this metal no art could have arisen; man had remained in the savage state, and disputed for his food by brute strength with the other animals. Without this metal, agriculture could not have existed, nor could the plough have rendered the earth fertile. Without iron, all the other metals would have been of no utility; for it is by means of this agent that they receive their varied forms and dimensions. Iron alone may be considered as the representative of every other metal, and it may be substituted in the place of any of them; but no metal can afford a substitute for iron. Though the scarcity, the brilliancy, and durability of gold and silver may place them in a higher rank in these respects, yet the service which iron renders to society entitles it to a higher degree of estimation in the minds of men who are accustomed to think with justice and propriety. It is true that it does not shine with a splendor equally strong; nature has not decorated it with so beautiful a color, but its intimate properties are much more precious. All the other metals might, in truth, be dispensed with; but iron, on the contrary, is indispensable and necessary. The condition of humanity would be truly miserable without this metal, as is proved by the history of those people with whom the art of working it is still unknown, and who, with joy and exultation, exchange the gold with which their country is enriched for morsels of iron which happier and more cultivated nations bring to them in exchange. Iron composes the first instrument of machines, and the first mover of mechanics. In the hands of men it governs, and, as it were, subdues all the products of nature. In successive obedience to his power, we behold it change the form and properties of other bodies, by the perpetual influence it exercises upon them. In a word, it is the soul of all the arts, and the source of almost every beneficial product.

Though a thousand facts in history prove that the ancients were not acquainted with the art of working iron like the modern nations, the historians of Chemistry have nevertheless placed the infancy of their science among the first operators at the forge, whose existence they have admitted almost in the first ages of the world.

The alchemists qualified iron with the name of Mars, by consecrating it to the god of war, in whose service it has been much

employed. From the denomination of Mars being given to iron, naturally flowed the appellation *martial*, which has been successively attributed to numerous preparations made with this metal.

Iron possesses a peculiar metallic brilliancy. When we wish to describe its color, we are obliged to say that it is white, rather livid, inclined to grey and to blue. In its texture it is formed of small fibrous threads, or small grains, and small plates very pointed. When examined with the microscope, it presents a great number of pores, or small cavities, more perceptible than in copper. It appears that its interior texture, as shown in its fracture, which is more or less fibrous, granulated, or lamellated, depends much on the method of its cooling, the pressure it has undergone, the manner of treatment, and the heat under which it has been forged or struck.

The specific gravity of iron varies from 7·600 to 7·800. Its hardness exceeds that of any other metal, and on this account it is used to grind, cut, fashion, engrave, and file most natural bodies, stones, wood, and particularly the other metals. It is also the most elastic of metals, and is therefore preferred to all the others for springs of every description.

The ductility of iron is also very considerable; but it is in some sort of a particular kind, or rather it is limited by its excessive hardness, or the cohesion of its particles. Though these adhere much more strongly than most of the other metallic substances, it cannot be made into plates as thin as are formed of several other of the latter; the thinnest sheet iron is in fact much thicker than very coarse leaves of lead or tin. For this reason iron is commonly placed in the fourth rank among metals as to its ductility, and this place is given on account of its ductility in the wire-drawer's plates. Its malleability is very limited on account of its firmness, so that its ductility is much more eminent and remarkable. A wire of this metal of one tenth of an inch in diameter supports a weight of four hundred and fifty pounds before it breaks, which cannot be done with any other metal, not even copper and platina, which approach the nearest to it. Muschenbroeck, by examining a parallelopipedon of iron, of one tenth of an inch in diameter, was obliged to use a force of seven hundred and forty pounds to break it; and he remarks on this occasion, that a similar piece of iron, forged of horse-shoe nails, which had remained for some time in the hoof of a horse, did not exhibit a greater tenacity. This opinion is, therefore, a prejudice which arises only from the goodness and purity of iron made use of for forging those nails. When heated to about 158° of Wedgewood's pyrometer, as Sir George M'Kenzie has ascertained, it melts. This temperature being nearly the highest to which it can be raised, it has been impossible to ascertain the point at which this melted metal begins to boil and evaporate. Neither has the form of its crystals been examined: but it is well known that the texture of iron is fibrous; that is, it appears when broken to be composed of a number of fibres or strings bundled together.

Iron is rapidly penetrated by the electric fluid. It is one of the best conductors of electricity; and, accordingly, since the discoveries of Franklin on the identity of atmospheric thunder and electric spark, it is employed with great success to fabricate those elevated conductors, which are appropriated by their gilded and unalterable terminations in a point, to attract without noise, and rapidly to transport, the electric matter into the earth, or into water, where their inferior extremities terminate. It has been long observed that iron thus vertically placed in an elevated situation of the atmosphere, if it remains a long time, or be struck with the electric fluid of lightning, assumes the properties of a magnet. If iron be struck in the air by the electric shock, it takes fire; but as this phenomenon belongs to the history of its combustion, we shall speak of it in another place.

Magnetism is one of the most characteristic, and at the same time most singular of the properties of iron. It was long supposed to be peculiar to this metal, but it is now well known that cobalt and nickel also possess it. Nevertheless, all the experiments relative to the magnetism of these two last metals not having been made either with the same accuracy, or to the same extent, as upon iron, the principal phenomena of this force have been well observed only in the latter metal.

The taste and smell are also two very distinct and very evident properties in iron. If we hold a piece of iron for some time in the hand, and afterwards hold it a little distance from the nose, we may discern its odor and quality.

When exposed to the air its surface is soon tarnished, and it is gradually changed into a brown or yellow powder, well known under the name of rust. This change takes place more rapidly if the atmosphere be moist. It is occasioned by the gradual combination of the iron with the oxygen of the atmosphere, for which it has a very strong affinity.

Carburet of iron is found native, and has been long known under the names of *plum-*

bago and *black lead.* It is of a dark iron grey or blue color, and has something of a metallic lustre. It has a greasy feel, is soft, and blackens the fingers, or any other substance to which it is applied. It is found in many parts of the world, especially in Britain,* where it is manufactured into pencils. It is not affected by the most violent heat, as long as air is excluded, nor is it in the least altered by simple exposure to the air or to water. A moderate heat produces no effect upon it, and occasions but little change in its bulk. It is used, therefore, in making the crucibles called *black lead.* It was long supposed to be incombustible.

* The chief mines are at Keswick in Cumberland, and in Airshire.

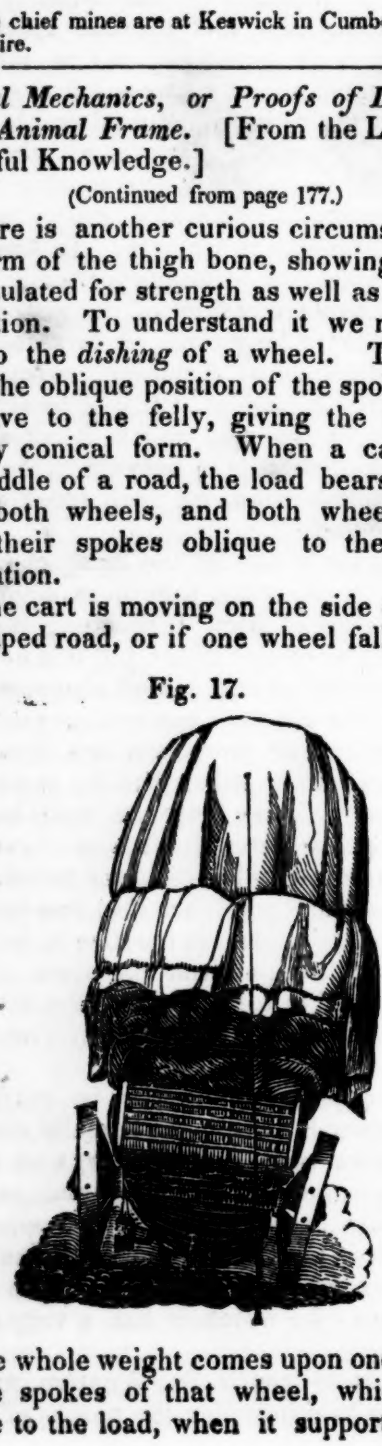
Animal Mechanics, or Proofs of Design in the Animal Frame. [From the Library of Useful Knowledge.]

(Continued from page 177.)

There is another curious circumstance in the form of the thigh bone, showing how it is calculated for strength as well as freedom of motion. To understand it we must first look to the *dishing* of a wheel. The dishing is the oblique position of the spokes from the nave to the felly, giving the wheel a slightly conical form. When a cart is in the middle of a road, the load bears equally upon both wheels, and both wheels stand with their spokes oblique to the line of gravitation.

If the cart is moving on the side of a barrel shaped road, or if one wheel falls into a

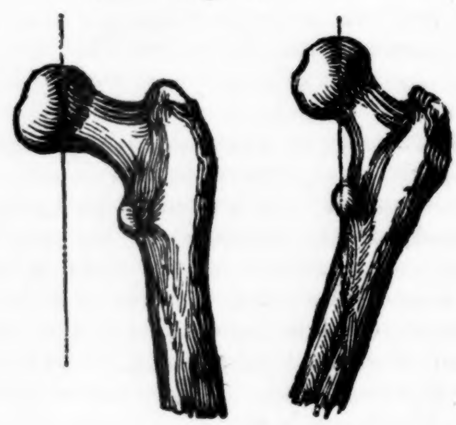
Fig. 17.



rut, the whole weight comes upon one wheel; but the spokes of that wheel, which were oblique to the load, when it supported only one-half of the weight, are now perpendicular under the pressure, and are capable of sustaining the whole. If roads were made perfectly level, and had no holes in them, the wheels of carts might be made without dishing; but if a cart is calculated for a country road, let the wheelwright consider what equivalent he has to give for that very pretty result proceeding from the obliquity of the spokes, or *dishing* of the wheel.

When we return to consider the human thigh bone, we see that the same principle holds; that is to say, that whilst a man stands on both his legs, the necks of the thigh bones are oblique to the line of gravitation of the body; but when one foot is raised, the whole body then being balanced on one foot, a change takes place in the position of the thigh bone, and the obliquity of that bone is diminished; or, in other words, now that it has the whole weight to sustain, it is perpendicular under it, and has therefore acquired greater strength.

Fig. 18.



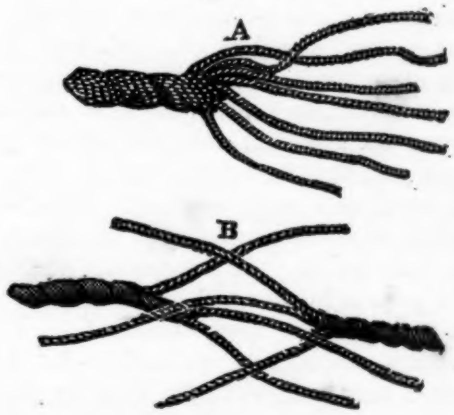
CHAPTER V.

Of the Tendons compared with Cordage.—Where nature has provided a perfect system of columns, and levers, and pullies, we may anticipate that the cords by which the force of the muscles is concentrated on the moveable bones, must be constructed with as curious a provision for their offices. In this surmise we shall not be disappointed. To understand what is necessary to the strength of a rope or cable, we must learn what has been the object of the improvements and patents in this manufacture. The first process in rope making is hatchelling the hemp; that is, combing out the short fibres, and placing the long ones parallel to one another. The second is spinning the hemp into yarns. And here the principle must be attended to, which goes through the whole process in forming a cable; which is that the fibres of the hemp shall bear an equal strain; and the difficulty may be easi-

ly conceived, since the twisting must derange the parallel position of the fibres. Each fibre, as it is twisted, ties the other fibres together, so as to form a continued line, and it bears at the same time a certain portion of the strain, and so each fibre alternately. The third step of the process is making the yarns. Warping the yarns is stretching them to a certain length; and, for the same reason that so much attention has been paid to the arrangement of the fibres for the yarns, the same care is taken in the management of the yarns for the strands. The fourth step of the process is to form the strands into ropes. The difficulty of the art has been to make them bear alike, especially in great cables, and this has been the object of patent machinery. The *hardening* by twisting is also an essential part of the process of rope-making; for without this it would be little better then extended parallel fibres of hemp. In this twisting, first of the yarns and then of the strands, those which are on the outer surface must be more stretched than those near the centre; consequently, when there is a strain upon the rope the outer fibres will break first, and the others in succession. It is to avoid this that each yarn and each strand, as it is twisted or hardened, shall be itself revolving, so that when drawn into the cable the whole component parts may, as nearly as possible, resist the strain in an equal degree; but the process is not perfect, and this we must conclude from observing how different the construction of a tendon is from that of a rope. A tendon consists of a strong cord apparently fibrous, but which, by the art of the anatomist, may be separated into lesser cords, and these by maceration, can be shown to consist of cellular membrane, the common tissue that gives firmness to all the textures of the animal body. The peculiarity here results merely from its remarkable condensation. But the cords of which the larger tendon consists do not lie parallel to each other, nor are they simply twisted like the strands of a rope; they are, on the contrary, plaited or interwoven together.

If the strong tendon of the heel, or Achilles tendon, be taken as an example, on first inspection it appears to consist of parallel fibres, but by maceration these fibres are found to be a web of twisted cellular texture. If you take your handkerchief, and, slightly twisting it, draw it out like a rope, it will seem to consist of parallel cords; such is, in fact, so far the structure of a tendon. But, as we have stated, there is something more admirable than this, for the tendon consists of subdivisions, which are like the strands of a rope; but instead of being twisted simply as by the process of hardening, they are plaited or interwoven in a way that could not be imitated in cordage by the turning of a wheel. Here then is the difference: by the twisting of a rope the strands cannot resist the strain equally, whilst we see that this is provided for in the tendon by the regular interweaving of the yarn, if we may so express it, so that every fibre deviates from the parallel line in the same degree, and consequently receives the same strain when the tendon is pulled. If we seek for examples illustrative of this structure of the tendons, we must turn to the subject of ship rigging, and see there how the seaman contrives, by undoing the strands and yarns of a rope, and twisting them anew, to make his splicing stronger than the original cordage. A sailor opens the ends of two ropes thus:*

Fig. 19.



and places the strands of one opposite and between the strand of another, and so interlaces them. And this explains why a hawser-rope, a sort of small cable, is spun of *three* strands; for as they are necessary for many operations in the rigging of a ship, they must be formed in a way that admits of being cut and spliced; for the separation of three strands, at least, is necessary for knotting, splicing, whipping, mailing, &c. which are a few of the many curious contrivances for joining the ends of ropes, and for strengthening them by filling up the interstices to preserve them from being cut or frayed. As these methods of splicing and plaiting in the subdivisions of the rope make an intertexture stronger than the original rope, it is an additional demonstration, if any were wanted, to show the perfection of the cordage of an animal machine, since the tendons are so interwoven; and until the yarns of

* A strands and yarns opened. B, ends opened and laid for splicing, in a manner exactly like the interlacing of the tendon.

one strand be separated and interwoven with the yarns of another strand, and this done with regular exchange, the most approved patent ropes must be inferior to the corresponding part of the animal machinery.

A piece of cord of a new patent has been shown to us, which is said to be many times stronger than any other cord of the same diameter. It is so far upon the principle here stated, that the strands are plaited instead of being twisted; but the tendon has still its superiority, for the lesser yarns of each strand in it are interwoven with those of other strands. It however gratifies us to see, that the principle we draw from the animal body is here confirmed. It may be asked, do not the tendons of the human body sometimes break? They do; but in circumstances which only add to the interest of the subject. By the exercise of the tendons, (and their exercise is the act of being pulled upon by the muscles, or having a strain made on them,) they become firmer and stronger; but in the failure of muscular activity, they become less capable of resisting the tug made upon them, and if, after a long confinement, a man has some powerful excitement to muscular exertion, then the tendon breaks. An old gentleman, whose habits have been long staid and sedentary, and who is very guarded in his walk, is upon an annual festival tempted to join the young people in a dance; then he breaks his tendo Achillis. Or a sick person, long confined to bed, is, on rising, subject to a rupture or hernia, because the tendinous expansions guarding against protrusion of the internal parts, have become weak from disease.

Such circumstances remind us that we are speaking of a living body, and that, in estimating the properties of the machinery, we ought not to forget the influence of life, and that the natural exercise of the parts, whether they be active or passive, is the stimulus to the circulation through them, and to their growth and perfection.

CHAPTER VI.

Of the Muscles—of Muscularity and Elasticity.—There are two powers of contraction in the animal frame—elasticity, which is common to living and dead matter, and the muscular power, which is a property of the living fibre.

The muscles are the only organs which properly have the power of contraction, for elasticity is never exerted but in consequence of some other power bending or stretching the elastic body. In the muscles, on the contrary, motion originates; there being no connection, on mechanical principles, betwixt the exciting cause and the power brought into action.

The real power is in the muscles, while the safeguard against the excess of that power is in the elasticity of the parts. This is obvious in the limbs and general texture of the frame; but it is most perfectly exhibited in the organs of circulation. If the action of the heart impelled the blood against parts of solid texture, they would quickly yield. When by accident this does take place, even the solid bone is very soon destroyed, but the coats of the artery which receive the rush of blood from the heart, although thin, are limber and elastic; and by this elasticity or yielding, they take off or subdue the shock of the heart's action, while no force is lost: for as the elastic artery has yielded to the sudden impulse of the heart, it contracts by elasticity in the interval of the heart's pulsation, and the blood continues to be propelled onward in the course of the circulation, without interval, though regularly accelerated by the pulse of the heart.

If a steam engine were used to force water along the water-pipes, without the intervention of some elastic body, the water would not flow continuously, but in jerks, and therefore a reservoir is constructed containing air, into which the water is forced against the elasticity of the air. Thus, each stroke of the piston is not perceptibly communicated to the conduit pipe, because the intervals are supplied by the push of the compressed air. The office of the reservoir containing air is performed in the animal body by the elasticity of the coats of the arteries, by which means the blood which flows interruptedly into the arteries has a continuous and uninterrupted flow in the veins beyond them.

A muscle is fibrous, that is, it consists of minute threads bundled together, the extremities of which are connected with the tendons which have been described. Innumerable fibres are thus joined together to form one muscle, and every muscle is a distinct organ. Of these distinct muscles for the motions of the body there are not less than four hundred and thirty-six in the human frame, independent of those which perform the internal vital motions. The contractile power which is in the living muscular fibre, presents appearances which, though familiar, are really the most surprising of all the properties of life. Many attempts have been made to explain this property, sometimes by chemical experiment, sometimes on mechanical principles, but always in a manner repugnant to common sense. We must be satisfied with saying that it is an endowment,

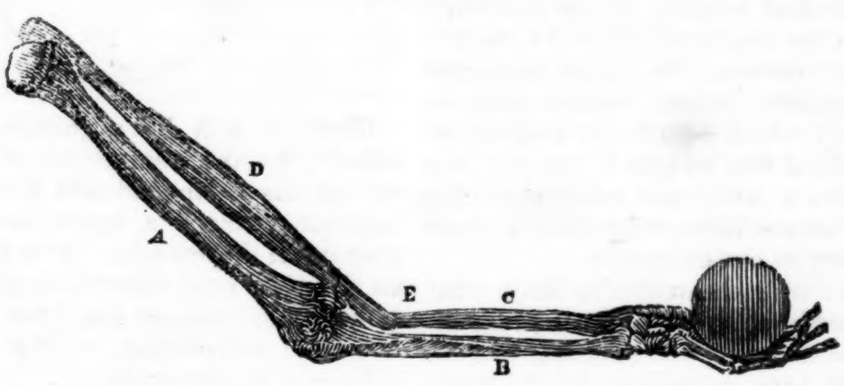
the cause of which it would be as vain to investigate as to resume the search into the cause of gravitation.

The ignorance of the cause of muscular contraction does not prevent us from studying the laws which regulate it, and under this head are included subjects of the highest interest, which, however, we must leave, to pursue the mechanical arrangement of the muscles.

Since we have seen that there are four hundred and thirty-six distinct muscles in the body, it is due to our readers to explain how they are associated to effect that combination which is necessary to the motion of the limbs, and to our perfect enjoyment. In the first place, the million of fibres which constitute a single muscle are connected by a tissue of nerves, which produce a unison or sympathy amongst them, so that one impulse causes a simultaneous effort of all the fibres attached to the same tendon. When we have understood that the muscles are distinct organs of motion, we perceive that they must be classed and associated, in order that many shall combine in one act; and that others, their opponents, shall be put in a state to relax and offer no opposition to those which are active. These relations can only be established through *nerves*, which are the organs of communication with the brain, or sensorium. The nerves convey the will to the muscles, and at the same time they class and arrange them to as to make them consent to the motions of the body and limbs.

On first looking to the manner in which the muscles are fixed into the bones, and the course of their tendons, we observe everywhere the appearance of a sacrifice of mechanical power, the tendon being inserted into the bone in such a manner as to lose the advantage of the lever. This appears to be an imperfection, until we learn that there is an accumulation of vital power in the muscle in order to attain velocity of movement in the member.

Fig. 20.

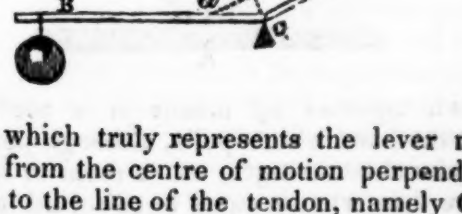


The muscle, D, which bends the fore-arm, is inserted into the radius, E, so near the fulcrum, or centre of motion, in the elbow joint, and so oblique, that it must raise the hand and fore-arm with disadvantage. But, correctly speaking, the power of the muscle is not sacrificed, since it gains more than an equivalent in the rapid and lively motions of the hand and fingers, and since these rapid motions are necessary to us in a thousand familiar actions; and to attain this the Creator has given sufficient vital power to the muscles to admit of the sacrifice of the mechanical or lever power, and so to provide for every degree and variety of motion which may answer to the capacities of the mind.

If we represent the bones and muscles of the fore-arm by this diagram, we shall see that power is lost by the inclination of the tendon to the lever into which it is inserted. It represents the lever of the third kind, where the moving power operates on a point nearer the fulcrum than the weight to be moved.

Here A represents the muscle, B the lever, and C the fulcrum. The power of the muscle is not represented by the distance of its insertion, *a*, from the fulcrum C. The

Fig. 21.



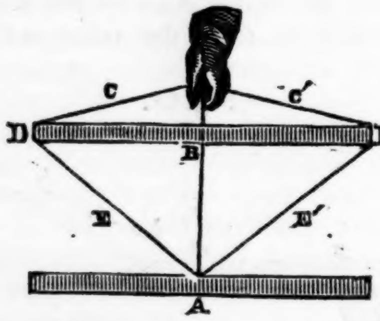
line which truly represents the lever must pass from the centre of motion perpendicularly to the line of the tendon, namely C *b*. Here again, by the direction of the tendon, as well as by its actual attachment to the bone, power is lost and velocity gained.

We may compare the muscular power to the weight which impels a machine. In studying machinery it is manifest that weight and velocity are equivalent. The handle of the winch in a crane is a lever, and the space through which it moves, in comparison with the slow motion of the weight, is the measure of its power If the weight raised by the crank be permitted to go down, the wheels revolve, and the handle moves with the velocity of a cannon ball, and will be as destructive if it hit the workman. The weight here is the power, but it operates with so much disadvantage that the hand upon the handle of the winch can stop it: but give it way, let the accelerated motion take place, and the hand would be shattered which touched it. Just so the fly wheel, moving at first slowly, and an impediment to the working of a machine, at length acquires momentum so as to concentrate the power of the machine, and enable it to cut bars of iron with a stroke.

The principle holds in the animal machinery. The elbow is bent with a certain loss of mechanical power; but by that very means, when the loss is supplied by the living muscular powers, the hand descends through a greater space, moves quicker, with a velocity which enables us to strike or to cut. Without this acquired velocity, we could not drive a nail; the mere muscular power would be insufficient for many actions quite necessary to our existence.

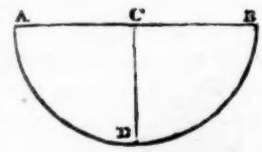
Let us take some examples to show what objects are attained through the oblique direction of the fibres of the muscles, and we shall see that here, as well as by the mode of attachment of the entire muscle, velocity is attained by the sacrifice of power. Suppose that these two pieces of wood, to be

Fig. 22.



drawn together by means of a cord, but that the hand which pulls, although possessing abundant strength, wants room to recede more than what is equal to one-third of the space betwixt the pieces of wood, it is quite clear that if the hand were to draw direct on the cord, A B, the point A would be brought towards B, through one-third only of the intervening space, and the end would not be accomplished. But if the cord were put over the ends of the upper piece, C, D, E, and consequently directed obliquely to their attachment at A, on drawing the hand back a very little, but with more force, the lower piece of wood would be suddenly drawn up to the higher piece, and the object attained. Or we may put it in this form: If a muscle be in the direction of its tendon, the motion of the extremity of the tendon will be the same with that of the muscle itself: but if the attachment of the muscle to the tendon be oblique, it will draw the tendon through a greater space; and if the direction of the muscle deviate so far from the line of the tendon as to be perpendicular to it, it will then be in a condition to draw the tendon through the greatest space with the least contraction of its own length.

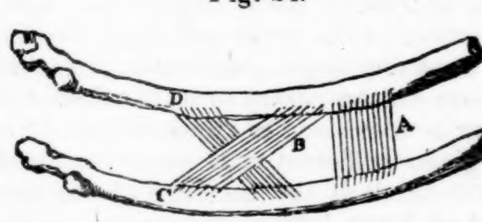
Fig. 23.



Thus, if A B be a tendon, and C D a muscle, by the contraction of C to D the extremities of the tendon A B will be brought together through a space double the contraction of the muscle. It is the adjustment on the same principle which gives the arrow so quick an impulse from the spring of the bow, the extremities of the bow drawing obliquely on the string.

To free breathing, it is necessary that the ribs shall approach each other, and this is performed by certain *intercostal* muscles, (or muscles playing between the ribs,) and now we can answer the question, why are the fibres of these muscles oblique?

Fig. 24.

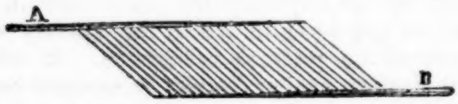


Let us suppose this figure to represent two ribs with thin intervening muscles. If the fibres of the muscle were in the direction A, across, and perpendicular to the ribs; and if they were to contract one third of their length, they would not close the intervening space; they would not accomplish the purpose. But being oblique, as at B,

although they contract no more than one-third of their length, they will bring the ribs C D together. By this obliquity of the intercostal muscles they are enabled to expand the chest, in inspiration, in a manner which could not be otherwise accomplished.

In the greater number of muscles the same principle directs the arrangement of the fibres; they exchange power for velocity of movement, by their obliquity. They do not go direct from origin to insertion, but obliquely, thus, from tendon to tendon:

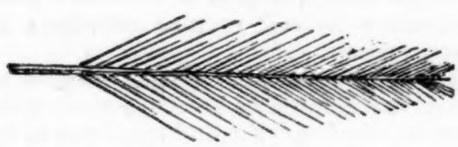
Fig. 25.



Supposing the point A to be the fixed point, these fibres draw the point B with less force, but through a larger space, or more quickly than if they took their course in direct lines; and by this arrangement of the fibres the freedom and extent of motion in our limbs are secured.

But the muscles must be strengthened by additional courses of fibres, because they are oblique; since by their obliquity they lose something of their force, and therefore it is, we must presume that we find them in a double row, making what is termed the *penniform* muscle, thus—

Fig. 26.



and sometimes the texture of the muscle is still further compounded by the intermixture of tendons, which permit additional series of fibres; and all this for the obvious purpose of accumulating power, which may be exchanged for velocity of movement.

Plan of an Apiary or Bee-house, by means of which the honey and wax can be taken without destroying the Bees. By G. [From the Quarterly Journal of Agriculture, &c.]

First,—Erect a building of wood, of dimensions according to the extent you may wish to avail yourself of the labor of bees. A frame building of 7 feet square, and 7 feet high to the eaves, will contain 90 hives of the dimensions after mentioned. The front should face the south or south-east. The sides of the house within should be shelved with stout plank, well supported by uprights and cross pieces, to hold the hives. The lower shelf may be about a foot from the floor, and the others about 14 inches apart. A tier of shelves is to be placed in the middle of the house, at the same distances from each other; this arrangement will leave two feet gangway between the shelves for the convenience of passing between the hives. There must of course be a door to each gangway, if the shelves are continued from the front to the rear of the house.

Secondly,—The hives must be made as near as may be of 12 inches square, and 12 inches high outside; it being found that a hive of these dimensions, well filled, is sufficient to support an ordinary swarm of bees through the winter. The hives should have a bottom board to fit close, but it need not be nailed fast; each hive must have two openings at bottom, exactly opposite each other, 3 inches wide, and ½ inch high; these openings are furnished with shutters of tin or thin wood, moveable in a groove, in order to close them when the hives are to be removed. On the opposite side of each hive should be inserted a pane of glass, covered with a shutter, to enable you to see, on raising the shutter, that the hives are full. For the greater convenience of opening and shutting the apertures into the hives, they should be made of a slit of tin long enough to reach from the aperture, when closed, to the outside of the hive. In the front of the house there must be openings to correspond with the front hives within, and on the outside there should be placed a small shelf to each aperture for the bees to alight on.

You may begin to stock your house in the winter with old hives, placing a new hive of the above dimensions in front of the old one, and in the spring the bees, after filling up the old comb, will fall to work in the new hive. As soon as you perceive this, you may drive the bees from the old hive by striking on it, or by injecting the smoke of tobacco, and take it away; or take it away and set it down in front of the house, invert it and take off the bottom board—before night, the bees will have all left it and gone into the new hive. When the new hive is filled, close the apertures, draw it back and place another in front; open the communication, and they will in like manner fill this hive. You thus continue to supply hives till your shelves are full. In the fall you may take up as many as you find there are no bees in, leaving however sufficient honey to support the stock through the winter.

In order to derive the greatest possible advantage from their bees, some people take away in the spring all the old comb and

honey that the bees have left unconsumed. But this should not be done until you are well assured that the bees can get their living from the early spring flowers. This can only be done, however, but by those persons the bees will not sting, or by protecting the hands and face from their attacks.

G.

Internal Improvements, No. IV. By F. To the Editor of the American Railroad Journal and Advocate of Internal Improvements.

Sir,—Before taking leave of the subject of turnpike roads, we must intreat your further indulgence for a few moments, to make a brief reply and offer a few remarks in relation to an objection that has been frequently advanced against the indiscriminate adoption of M'Adam's system of construction. It may be true, as has been stated, that there are spots highly favored in themselves as to natural advantages,—rich in every mineral and agricultural resource—but at the same time so sequestered and shut out beyond the pale of intercourse with more populous parts of the country, as to render them unavailable, except to a very limited extent. Capitalists, however, cannot be induced to embark in projects that offer but little promise of profit, and that little uncertain and remote. They require something more tangible, and will not seek in distant quarters for that which they may have without seeking at home; and it therefore stands to reason, that so long as safer and more advantageous investments are to be met with here by greater facilities, such places, however strong their claim to notice may be, must of necessity remain in a state of crude, uncultivated nature, or be content with such modifications of approved plans as may be in some degree commensurate with their available means.

We are no friends to the forcing system, and would at any time use our best efforts to discourage any project having a tendency to that end; but, we still think that some substitute might be safely recommended to meet such cases as those alluded to above, without in any manner compromising the great end of Internal Improvements, which is to bring out to the best advantage the resources of a country by any means that the nature and extent of those resources will justify. If a substitute be adopted, it should combine in its qualifications a hard and even surface, with great cheapness of construction. These are qualities indispensably necessary to the furtherance of the end in view—and as they seem to be embodied in a plan recently proposed by an engineer of some eminence in Ohio, we shall content ourselves in referring to a former number of this journal for a full explanation of its principles, by observing that much depends upon the quality and seasoning of the timber used in the formation of the ways. Evaporation principally takes place in the direction of the fibres of the wood; and the juxtaposition of the parts where green timber is used must therefore prevent the whole escape of the natural juices. Decay, under these circumstances, is soon engendered, and the durability of the road thereby materially affected. The originality and real merit of the plan, however, recommend it warmly to notice; and, as applicable to the cases alluded to above, where preliminary measures are necessary to the introduction of more perfect means, it is particularly deserving of attention. For the end ever to be kept in view, in the introduction of all improvements and innovations, should be the best interest of the particular section of country through which it may pass; and to this effect such measures only should be adopted as a calm and deliberate examination of its condition, with a careful investigation of its capacity of improvement, may dictate as most conducive to the speedy developement of its natural resources. It will be admitted that every district possesses certain capabilities, which are only prevented from being brought into action by its distance from some sea-port town; and that every place having a tendency to increase its facilities of intercourse therewith must exercise a corresponding influence on the improvement of its condition. It is still, however, of vital importance to the early and successful establishment of prosperity, that the infantine exertions of such district be carefully fostered and guarded against all undue encroachments—thus, an avenue being laid open, no further apprehension need be entertained. A change of condition will soon be manifested by increased activity and prosperity; and its necessities will thenceforth be promptly met by additional facilities: for, as the motive that first incites to action stimulates with greater force to perseverance, so the enjoyment of increased prosperity animates to still greater exertions for its consummation.

As civilization attains a higher degree of perfection, and commerce becomes more generally extended, the luxuries and comforts of life demand the adoption of some new mode of communication more suitable to the advanced state of the arts and manufactures. Railroads and canals thence took their rise; and all countries to which ancient history directs our attention, seem to have availed of them according as necessity has dictated or circumstances justified. Indeed, it is a remarkable fact, that the only countries which have never emerged from their primitive state of barbarism and ignorance are those which are destitute of the means of inland navigation. This is strikingly exemplified in the inland parts of Africa, and in that part of Asia lying north of the Euxine and Caspian—the ancient Scythia and the modern Tartary and Siberia. On the other hand, wherever these means have been enjoyed, there civilization has prospered, and the arts and sciences have flourished. Thus, Egypt was the birthplace of agriculture and manufactures—the banks of the Nile were the sites of its towns and villages, which, together with those of the ancient Indians and Chinese, derived their prosperous condition and immense wealth almost exclusively from their inland navigation.

The experience of past ages therefore proves

to us that every means, having for its end the promotion of internal commerce, is deserving the consideration of all civilized communities, and particularly of one like our own, in the enjoyment of every variety of soil and clime, and capable of every species of production, either of agriculture or manufactures. The system of society is so complex in its character, and its various orders so mutually interwoven by natural causes, that a good effect cannot be produced in any one part without exercising a corresponding happy influence over the other; generating thereby a mutual dependance among all classes—the high, the low—the rich, the poor—the agriculturist, the manufacturer. The interests of each converge towards the same point; and it should, therefore, be the duty of each, collectively and individually, to concentrate their energies, and unite their efforts, to the accomplishment of the same great end. Once establish a mutual interchange of the different products of industry, by facilitating the means of intercourse between distant places, and the very objects of that industry thence become more varied, and the general commerce of the country less liable to interruption from the effects of artificial causes; and the action of any particular calamity, to which every society in its social character is more or less exposed, would thence produce but a temporary and partial evil, and would find its own correction in the reaction produced by a continuation of the exciting cause.

These remarks will not, of course, apply to a country exclusively possessing agricultural industry. In such country, the influence of foreign competition on its peculiar staples exercises a direct tendency to stimulate production to an extent that is calculated to overstock and glut the market. The price of the article thence becomes insufficient to meet the expense of raising it; and the cultivator, as a consequence, unless speedily relieved by the introduction either of new staples or new markets of consumption, must sooner or later sink under the pressure, and be reduced to the lowest state of poverty. A most deplorable instance of this truth has already been experienced in some of the Southern States of this Union—where the very articles that, for many years, proved a fertile source of revenue to the cultivator, became, not long since, owing to an excessive production, so reduced in value as to be altogether inadequate to the task of maintaining him above actual want.

But, however palpable the causes by which these effects are produced may appear, it is still a prolific source of speculation among philanthropists how far the rapid extension of manufactures, through the medium of machinery and internal improvements, is advantageous to a country as regards its moral and social condition. It has been observed, and cannot be denied, that every improvement in machinery, by which manual labor is materially lessened, is calculated to produce distress with a certain class of the community, by depriving them of their usual means of employment, and obliging them thereby to recommence the world, so to speak, in the adoption of some new vocation. But, at the same time, it must be remembered that the direct tendency of the operation of any improvement of this kind is to increase the consumption of the product of its labors by lessening its nominal value. A wider field is thus at once opened to enterprise—additional resources made attainable,—and, therefore, while the evil complained of is only temporary, and confined to a limited, a very insignificant numerical portion of that community, the benefit conferred is permanent and diffused throughout the whole mass of society. Besides, what tends more to elevate the condition of the poor—to exalt and ennoble the character of man—than the encouragement of all such means as will supersede the necessity for application of mere animal force? It is the degrading tendency of his occupation which alone reduces the poor operator to the lowest grade of human depravity—hardens his conscience—and stifles in his breast every natural feeling of moral excellence. Relieve his mind from this sense of degradation, and his ambition will soon take a loftier flight. He will feel a superiority over the brute creation that will elevate him above his former sphere and urge him on to greater efforts. The faculties of mind thus awakened will be thenceforth directed to the accomplishment of those means of luxury and enjoyment that before were only attainable at unceasing toil and labor.

It is unnecessary to pursue this subject further; for it is obvious that every improvement in machinery must be attended by results highly beneficial to the community at large; and internal communications, as a step preliminary to their introduction and application, should engage a large share of attention from every well wisher to his country. Let every channel, therefore, through which information on the subject can be derived, be opened to public inspection; let its sources be examined with a view to the general good; and let its stream flow pure and unadulterated by the poison which has hitherto polluted it, and we then hazard nothing in the assertion that, under its genial influence, the arts of peace will be cherished and commercial reciprocities cultivated. F.

New-York, February 8, 1834.

Landscape Gardening.—From the Report of the Visiting Committee of the New-York Horticultural Society for 1828, we make an extract. The subject still needs the encouragement of the Society.

"With regard to landscape gardening, the Committee have to report that, from the examination which they were able to make in the vicinity of this city, they are of opinion this part of horticulture is yet in its infancy among us as an art. The art of laying out grounds, so as to display all their beauties and conceal their defects, is a subject of much interest in Europe, where large sums are expended in embellishing the grounds surrounding the dwellings of the proprietors. There the

profession of landscape gardener is common, though almost unheard of among us; a profession requiring the practical gardener's skill, with a knowledge of the qualities and nature of forest trees, their capacity for picturesque effect, either separately or in groupes, a correct taste in selecting natural or creating artificial beauties, and a practised eye in discriminating the varied features of natural scenery. With these qualifications, the landscape gardener has tracts of land of considerable extent and diversity to operate on, assisted by all the resources which the wealth and taste of the proprietor can supply. The grounds attached to the country residences of our citizens are usually too limited to give much opportunity for the display of this style of gardening, and are generally appropriated to the more useful and profitable purposes of the kitchen garden, or the orchard, a small portion near the dwelling being reserved for parterres. There are, however, many beautiful sites in the neighborhood of our city, particularly those which border on our waters, in which a fine effect might be produced, by a proper application of the principles of this branch of horticulture. For improvements in this, as well as in the preceding departments, we must depend upon the greater diffusion of wealth among us, and the consequent greater leisure and opportunities for devotion to the pleasures of such pursuits. It is the legitimate province of our society to accelerate the progress of improvement in this respect; and the committee would beg leave to recommend the subject to their attention, as worthy of the same encouragement which the Society offers to the other branches of horticultural skill. A. Halsey, Chairman.

"New-York, January 27, 1829."

Planting a Vine.—Every proprietor of a house in this city should plant one or more vines in the yard. By so doing, he will add, in four or five years, at least ten dollars to his rent. Most people would be induced to give an additional sum in the rent of a house, in the yard of which there is a fine bearing grape vine. The Isabella is so certain in its growth, and in its bearing, and so cheap too, that no landholder need be disappointed in realizing the fruit of his labor and expense.

Posts.—The Shakers at Union Village have been in the habit of making oak posts as durable as locust, by a very simple and easy process. This is merely to bore a hole in that part of the post which will be just at the surface of the earth, with such a slope as will carry it just below the surface, and fill it with salt.

Preservation of Ink.—It is well known that the common writing ink, commonly made of vinegar or water for the liquid, cause the ink to mother, dry, and of course becoming thick, and unfit for use, unless often mixed up. Having occasion lately to make use of some strong salt-brine, for a certain purpose, and placing the vessel containing the brine near my inkstand, the thought occurred to me, that it would prevent the mothering and drying up of the ink, by mixing it with the thick substance in the inkstand. Accordingly I mixed some of the brine with the inky matter, and found upon a fair trial, my anticipation realized. It keeps the inky compound entirely free and open, consequently the pen clean, which is a great desideratum with all who have use for the goosequill. Please try and satisfy yourself. J. N. B.—[N. E. Farmer.]

To prevent Beer from becoming Acetous.—There is a way to prevent beer from getting acetous, or what is called hard, which is as simple as it is efficacious. Reasoning on the plain principles of chemical science, we were led to try it, and have this summer found its truth and advantage. It is nothing more than to suspend a knob of marble by a piece of tape from the bung hole to near the bottom of the barrel, upon which, being pure carbonate of lime, the acid quality of the beer acts on its incipient formation: it consequently becomes neutralised, and thus is kept from turning hard or sour. In our experiment the marble was considerably eaten away, except where the tape encircled, and the beer remained sound and fresh to the last drop. We mention this discovery as being a point of some consequence to householders, and especially to farmers and their laborers in harvest time; for it is more likely that weak beer should become sour than strong; it is much more healthy to drink it fresh than ever so little turned off, and, in the way of economy, many barrels might be saved, which are every year thrown into the hog-tub from becoming undrinkable. It will do good, however, to every species of beer, and, we expect, to any kind of home-made or even foreign wines in cask, which have or are likely to become tart or sour.—[Oxford Journal.]

RECEIPT FOR DRESSING SALLAD.

BY THE REV. SIDNEY SMITH.

Two large potatoes, pressed through kitchen sieve,
Smoothness and softness to the sallad give,
Of mordent mustard add a single spoon,
(Distrust the condiment that bites too soon;)
But deem it not, thou man of herbs, a fault,
To add a double quantity of salt,
Four times the spoon with oil of Lucca crown,
And twice with vinegar procured from town;
True flavor needs it, and your poet begs,
The pounded yellow of two well boiled eggs;
Let onions' atoms lurk within the bowl,
And, scarce suspected, animate the whole:
And lastly, in the flavored compound toss
A magic spoonful of anchovy sauce.
O! great and glorious,—O! herbaceous treat,—
'Twould tempt the dying anchorite to eat;
Back to the world he'd turn his weary soul,
And plunge his fingers in the sallad bowl.

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